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The infant motor profile

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Appendices

APPENDIX I: SUMMARY ON THE DOMAINS AND ITEMS OF THE INFANT MOTOR PROFILE

The Infant Motor Profile consists of five domains. The items and scoring methods of each domain are listed below. IMP scores are calculated for each of the five domains according to the following formula:

$$\text{Score} = \frac{\text{Sum of item scores}}{(\text{number of items of domain} - \text{number of items not assessed}) * \text{maximum score of items}} * 100\%$$

Items are not assessed when a certain motor behaviour is not observed (e.g. the item 'variation of arm movements during walking' is not assessed when a child is not able to walk). 'Maximum score of items' is the maximum score among the items of the domain. For the domains variation-size of repertoire, variability-ability to select and fluency the maximum score for each item is 2 and for the domain symmetry the maximum score is 3. Because the performance domain contains items with different numbers of maximum scores, scores are weighted before computing the performance domain score. The total IMP score is computed by summing the scores on the five domains and dividing this number by 5. All scores on the domains and the total IMP score are expressed as a percentage, with a maximum score of 100%.

Domain 1: Variation – size of repertoire

Scoring for variation-items is as follows:

1. Insufficient variation.
2. Sufficient variation.

Items of this domain:

- | | | |
|--|-----|------------------|
| 1) Variation of head movements (Sup) | | |
| 2) Posture, presence of ATNR (Sup) | P/F | N/O ^a |
| 3) Posture, presence of hyperextension of neck and trunk (Sup) | P/F | N/O |
| 4) Variation of arm movements (Sup) | | |
| 5) Variation of finger movements (Sup) | | |
| 6) Variation of leg movements (Sup) | | |
| 7) Variation of toe movements (Sup) | | |
| 8) Variation of reaching or prereaching movements of the arms (Sup) | | |
| 9) Variation of hand motility during reaching, grasping and manipulation (Sup) | | |
| 10) Variation of head movements (P) | | |
| 11) Variation of pre-crawling movements of the legs (P) | | |
| 12) Variation of wriggling, pivoting or crawling (P) | | |
| 13) Variation in sitting motility (Sit) | | |
| 14) Variation in sitting up behaviour (Sit) | | |
| 15) Bottom shuffling (Sit) | P/F | N/O ^a |
| 16) Variation in standing up behaviour (S&W) | | |

17) Variation of arm movements (S&W)		
18) Variation of trunk movements (S&W)		
19) Variation of leg movements (S&W)		
20) Variation of placing of feet (S&W)		
21) Variation of prereaching or reaching movements of the arms(RGM)		
22) Variation of hand motility during reaching and grasping (RGM)		
23) Facial expression (Gen)		
24) Drooling (Gen)	M	N ^b
25) Presence of stereotyped tongue protrusion (Gen)	Yes	No

Exceptions to the standard scoring are denoted in the second and third column: ^a P/F = persistent or frequent, N/O = no or occasionally, ^b M = marked drooling, N = no or little drooling

Domain 2: Variability – ability to select

All items of this domain are scored as follows:

1. No selection.
2. Adaptive selection.

Items of this domain:

- 1) Variability of head movements: ability to make an adaptive selection (Sup)
- 2) Variability of reaching or prereaching movements of the arms: ability to make an adaptive selection (Sup)
- 3) Variability of hand motility during reaching, grasping and manipulation: ability to make an adaptive selection (Sup)
- 4) Variability of head movements: ability to make an adaptive selection (P)
- 5) Variability of wriggling, pivoting or crawling: ability to make an adaptive selection (P)
- 6) Variability in sitting motility: ability to make an adaptive selection (Sit)
- 7) Variability in sitting up behaviour: ability to make an adaptive selection (Sit)
- 8) Variability in standing up behaviour: ability to make an adaptive selection (S&W)
- 9) Variability of arm movements: ability to make an adaptive selection (S&W)
- 10) Variability of trunk movements: ability to make an adaptive selection (S&W)
- 11) Variability of leg movements: ability to make an adaptive selection (S&W)
- 12) Variability of placing of feet: ability to make an adaptive selection (S&W)
- 13) Variability of prereaching or reaching movements of the arms: ability to make an adaptive selection (RGM)
- 14) Variability of hand motility during reaching and grasping: ability to make an adaptive selection (RGM)
- 15) Facial expression: ability to make an adaptive selection (Gen)

Domain 3: Symmetry

All items of this domain are scored as:

1. Strong asymmetry.
2. Moderate asymmetry.
3. No or mild asymmetry.

Items of this domain:

- 1) Position of head (Sup)
- 2) Reaching, grasping and manipulation of objects (Sup)
- 3) Position of head (P)
- 4) Arm posture and motility during activity in prone (P)
- 5) Position of head during sitting (Sit)
- 6) Position of trunk during sitting or supported sitting (Sit)
- 7) Arm posture and motility during sitting or supported sitting (Sit)
- 8) Arm posture and motility during independent walking (S&W)
- 9) Leg posture and motility during independent walking (S&W)
- 10) Reaching, grasping and manipulation of objects (RGM)

Domain 4: Fluency

All fluency items of this domain are scored as:

1. Majority of movements non-fluent.
2. Majority of movements fluent.

All items with presence or absence of tremor are scored as:

1. Frequently tremor present.
2. No or occasionally tremor present.

Items of this domain:

- 1) Tremor during reaching or prereaching (Sup)
- 2) Fluency of motor behaviour in supine (Sup)
- 3) Fluency of motility during independent walking (S&W)
- 4) Tremor during reaching or prereaching (RGM)
- 5) Fluency of motility during reaching or prereaching (RGM)
- 6) Tremor (Gen)
- 7) Fluency of motor behaviour (Gen)

Domain 5: Performance

Performance items are not scored in a standard fashion, but are adapted to the specific motor function and range from two to seven options.

Items of this domain:

- 1) Control of head movements (Sup)
- 2) Manipulative behaviour of hands and fingers (Sup)
- 3) Tilting of pelvis (Sup)
- 4) Rolling from supine to prone (Sup)
- 5) Reaching, grasping and manipulation of objects (Sup)
- 6) Head lift in prone (P)
- 7) Functional ability of shoulder girdle (P)
- 8) Functional ability of hands (P)
- 9) Rolling from prone to supine (P)
- 10) Progression in prone: development of crawling (P)
- 11) Control of head movements (Sit)
- 12) Sitting ability (Sit)
- 13) Position of trunk, preference posture (Sit)
- 14) Need of arm support (Sit)
- 15) Sitting up (Sit)
- 16) Standing ability (S&W)
- 17) Standing up (S&W)
- 18) Walking (S&W)
- 19) Balance during independent walking (S&W)
- 20) Arm posture and motility (S&W)
- 21) Heel-toe gait (S&W)
- 22) Reaching, grasping and manipulation of objects (RGM)
- 23) Type of grasping (RGM)

Sup = supine, P = prone, Sit = sitting, S&W = standing and walking, RGM = reaching, grasping and manipulation, Gen = general

APPENDIX IIA: EXTENDED VERSION OF TABLE IIIA (CHAPTER 2): VALIDITY OF THE TESTS

Assessment (short name)	Construct validity	Concurrent validity	Predictive validity for CP or minor developmental disorders (e.g. DCD, MND)
<i>Touwen</i>	nda	nda	Group of 37 high and low risk infants: sensitivity of Touwen assessment at 3 to 4 mo for development of complex MND at age 1.5 yrs is 75% (3/4), specificity 94%; group of 52 high and low risk infants: sensitivity of Touwen assessment at 3 to 4 mo for development of complex MND at 4 to 9 yrs 44% (4/7), specificity 78% ^{19,74}
<i>Amiel-Tison</i>	Sensitivity to detect children with ultrasound abnormalities of the brain 0.97 (35/36); children with abnormalities on cerebral function monitoring 0.89 (23/26); children with EEG abnormalities 0.88 (16/18) ⁴²	Group of 54 PT infants, assessment at term age and 3 mo, concurrent validity with GM method: kappa 0.87 and 0.54 ⁴³	Data on 152 PT children: sensitivity of Amiel-Tison neurological assessment at 1 yr and cognitive and motor outcome at 4 yrs is 94% (16/17) ^{44,45} , probability of the need for extra educational provision at 8 yrs 9.87% ⁴⁵ and sensitivity for neurodevelopmental outcome at 14-15 yrs 86% (12/14), specificity 33% (39/120). ⁴⁶ 45 PT infants, Amiel-Tison neurological assessment at term age and 3 mo, neurological outcome at 12-15 mo: PPV 0.68 and 0.83, sensitivity 0.92 and 1.00, specificity 0.45 and 0.75 ⁴³
<i>Muscle power</i>	Clear differences in optimality of muscle power regulation between PT and FT infants and infants with different grades of risk score including grade of PVL ^{47,48}	++	nda
			44 infants with PVF or PVL, combined results of muscle power development in shoulders and trunk at 3 mo together with shoulders at 6 mo: sensitivity to predict neuromotor outcome at 18 mo 85% and specificity 79% ⁴⁹

Assessment (short name)	Construct validity		Concurrent validity	Predictive validity for CP or minor developmental disorders (e.g. DCD, MND)
<i>HINE</i>	Good correlation with findings on MRI scan ⁵⁰	+	nda	Data on 74 PT infants, assessment at CA 6-15 mo; 53 FT infants with hypoxic-ischemic encephalopathy, assessment at age 9-14 mo; 24 infants with cystic PVL, assessment at CA 6-9,5 mo: good prediction of locomotor function at age 2 yrs. and 4 yrs. ⁵⁰⁻⁵²
<i>PRP</i>	Theoretical assumption: selected primitive reflexes are related to onset of motor function in normal and brain-damaged children; assumption not validated. No relation between primitive reflexes and motor development was found ⁵³	-	Group of 165 TD children: no correlation between AIMS and PRP-score at ages 6 wks., 3 mo and 5 mo ⁵³	nda
<i>Infanib</i>	Clear differences in scores on certain neuromotor categories between healthy FT and PT and ill PT infants ⁵⁴	+	nda	209 PT LBW infants: specificity of motor evaluation with <i>Infanib</i> at 7 mo regarding CP at age 36 mo is unsatisfactory, normal neuromotor assessment at 7 mo is highly predictive of subsequent normal motor function (specificity 100% (111/111)) ⁵⁵
<i>BSID-II</i>	Constructs more differentiated with age ²⁹	±	Group of 44 TD and low-risk PT infants, assessment at 12, 15 and 18 mo, concurrent validity with Peabody gross motor scores: $r = .78$ to $r = .96$ and with Peabody fine motor scores: $r = .25$ to $r = .57$ ⁵⁶	nda

Assessment (short name)	Construct validity	Concurrent validity	Predictive validity for CP or minor developmental disorders (e.g. DCD, MND)
PDMS-II	Subtest scores correlate with age ⁶⁶	± Group of 44 TD and low-risk PT infants, assessment at 12, 15 and 18 mo, concurrent validity with BSID-II of gross motor scores: $r = .78$ to $r = .96$ and of fine motor scores: $r = .25$ to $r = .57$ ⁶⁶	± 44 FT and low risk PT infants, PDMS at 12 mo: prediction of scores on BSID motor scales at 18 mo $r = .54$ (PT) and $r = .56$ (FT), PDMS at 15 mo: $r = .59$ (FT) and $r = .66$ (PT) ⁶⁶
MAI	nda	nda	± 246 high-risk infants MAI 4 mo, correlation with Bayley motor scale at age 2 yrs $r = -0.37$ ($p < 0.001$), 75 PT infants MAI at 4 mo CA sensitivity and specificity for developmental outcome at 18 mo resp. 61% (14/23) and 83% (43/52) ^{57,62} 77 high risk infants, MAI at 4 mo and gross and fine motor evaluations (PDMS and Frostig Eye Motor Coordination subtest) at 4,5 yrs: Spearman's rho resp. -0.12 (n.s.) and -0.23 ($p \leq 0.05$) ⁶⁰
NBI	Clear distinction in scores between FT and PT infants ^{54,63}	+	nda
TIME	Children with motor delays differ from children without delays in sequences of movements when assessed from several starting positions ⁶⁴	±	nda

Assessment (short name)	Construct validity	Concurrent validity	Predictive validity for CP or minor developmental disorders (e.g. DCD, MND)
<i>AIMS</i>	At age 8 mos. clear differentiation between neurologically normal, suspect or abnormal infants ⁶⁵	120 TD and 68 delayed infants, concurrent validity with BSID motor scale: $r = .97$ and $.93$; with PDMS gross motor scale: $r = .99$ and $r = .95$ ⁶⁶	173 high-risk infants, predictive validity of AIMS-score at 4 mo for 18 mo neurological outcome: PPV = 40% (sensitivity 77%, specificity 82%) AIMS-score at 8 mo: PPV = 66% (sensitivity 87%, specificity 93%) ⁶⁶
<i>SOMP-I</i>	Clear differences in quality of motor performance between FT and PT infants ⁶⁸	nda	nda
<i>TIMP</i>	TIMP scores are sensitive to changes in infants' motor performance due to maturation and medical complications ³⁷ Good discrimination between TD infants, infants with CP and infants with developmental delay ⁷⁰	Assessment at 3 mos., TIMP identified 80% of the same infants as the AIMS ⁷²	96 infants, TD and high-risk, predictive validity of TIMP-score at 3 mo for the AIMS-score at 12 mo $r = .55$ ⁷² 61 TD and risk-infants, predictive validity of TIMP-score at 3 mo for PDMS-II at 4-5 yrs. $r = .69$, PPV = 92% (sensitivity 62%, specificity 97%) ⁷¹

Assessment (short name)	Construct validity	Concurrent validity	Predictive validity for CP or minor developmental disorders (e.g. DCD, MND)
GfMs	Presence of abnormal GfMs is linked to discernable lesions of the brain ⁴⁰ and pre-, peri- and neonatal adversities such as PT birth and IUGR ^{41,74}	++ Mixed group of 80 high and low risk infants, assessments at 0-4 mo. concurrent validity with neurological examination: Spearman rho's 0.32-0.55 ⁴¹ 58 FT infants with HIE and 66 PT: agreement between GM and neurological examinations 80% ^{75,76}	+ 52 low and high risk infants, GM-assessment at 2-4 mo, neurological follow-up at 4 to 9 years: abnormal GfMs at fidgety age have sensitivity for development of CP 88% (7/8) and specificity 100% ⁴¹ , mildly abnormal GfMs are related to development of MND, ADHD and aggressive behaviour at 4-9 yrs (specificity 58% ⁴¹ and neurological condition (normal, simple MND and complex MND) at 9-12 yrs (rho 0.46, p<0.01) ⁷⁸ 130 FT and PT infants, GM assessment at 6-20 wks, neurological outcome at 2 yrs: sensitivity for CP 98% (43/44), specificity 96% (67/70) ^{40,77}

BSID = Bayley Scales of Infant Development, CP = cerebral palsy, HIE = hypoxic ischemic encephalopathy, IUGR = intra uterine growth retardation, MND = minor neurological dysfunction, mo = month(s), nda = no data available, PDMS = Peabody Developmental Motor Scale, PPV = positive predictive value, PVF = periventricular flaring, PVL = periventricular leukomalacia, TD = typically developing, VLBW = very low birth weight, yrs. = years, ++ = very good, + = good, ± = moderate, - = poor

APPENDIX IIB: EXTENDED VERSION OF TABLE IIIB (CHAPTER 2): RELIABILITY OF THE TESTS

Assessment	Intra-observer agreement	Interobserver agreement
<i>Touwen</i>	nda	nda
<i>Amiel-Tison</i>	nda	Only data available on passive muscle tone items: reliability excellent to poor for various manoeuvres ²⁰ : ±
<i>Muscle power</i>	nda	nda
<i>HINE</i>	nda	Correlation coefficient close to 1 ²² : ++
<i>PRP</i>	nda	Agreement 72 to 95% ²⁴ : +
<i>Infanib</i>	nda	nda
<i>BSID-II</i>	nda	$r = 0.75$ (motor), $r = 0.96$ (mental) ²⁹ : +
<i>PDMS-II</i>	nda	$r = 0.96$ ³¹ : ++
<i>MAI</i>	Kappa: 10% of items excellent reliability, 42% fair to good, 48% poor reliability ⁶¹ : ±	Overall score: $r = 0.72$ ⁶² item reliability: kappa: 2% of items excellent reliability, 58% fair to good, 40% poor reliability ⁶¹ : ±
<i>NBI</i>	nda	nda
<i>TIME</i>	nda	$r = 0.88 - 0.99$ ⁶⁴ : ++
<i>AIMS</i>	$r > .99$ ⁶⁷ : ++	$r > .99$ ⁶⁷ : ++
<i>SOMP-I</i>	Agreement 62% ⁶⁹ : ±	Agreement 80% ⁶⁹ : +
<i>TIMP</i>	nda	Agreement 95% ⁷³ : +
<i>GMS</i>	Kappa 0.8 ^{41,74} : ++	Kappa 0.8 – 0.9 ^{40,41,74} : ++

nda = no data available, r = Spearman's rho

APPENDIX III: INFANT MOTOR PROFILE



Infant Motor Profile

Developmental Neurology
University Medical Center Groningen, The Netherlands



Name:

Birth date:

Assessment date:

(Corrected) Age:

Assessor:

Supine

- 1 **Control of head movements** **[P]**
 - 1 ☐ cannot control head movements
 - 2 ☐ can control head movements to a limited extent
 - 3 ☐ can fully control head movements
- 2 **Variability of head movements** **[V/A]**
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 3 **Variability of head movements: ability to make an adaptive selection** **[V/B]**
 - 1 ☐ no selection
 - 2 ☐ adaptive selection
- 4 **Position of head, prevailing head position to one side** **[S]**
 - 1 ☐ strongly prevailing head position to the ☐ R / ☐ L
 - 2 ☐ moderately prevailing head position to the ☐ R / ☐ L
 - 3 ☐ no or mildly prevailing head position to one side
- 5 **Posture, presence of ATNR** **[V/A]**
 - 1 ☐ persistently and obligatory occurring ATNR
 - 2 ☐ frequently occurring ATNR, but infant can also show other postures
 - 3 ☐ no ATNR or occasionally non-obligatory ATNR
- 6 **Posture, presence of hyperextension of neck and trunk** **[V/A]**
 - 1 ☐ persistent hyperextension
 - 2 ☐ frequently occurring hyperextension
 - 3 ☐ no or rarely hyperextension
- 7 **Manipulative behaviour of hands and fingers** **[P]**
 - 1 ☐ no manipulative behaviour, excluding thumb sucking
 - 2 ☐ manipulates clothes / with hands in midline / knees / feet or puts hand(s) into mouth
- 8 **Variability of arm movements** **[V/A]**
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 9 **Variability of finger movements** **[V/A]**
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 10 **Tilting of pelvis** **[P]**
 - 1 ☐ no tilting of pelvis
 - 2 ☐ tilts pelvis, but not in a such a way that hands may be able to touch knees
 - 3 ☐ tilts pelvis in such a way that hands may be able to touch knees
 - 4 ☐ hands play with feet
 - 5 ☐ puts toes into mouth
- 11 **Variability of leg movements** **[V/A]**
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 12 **Variability of toe movements** **[V/A]**
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 13 **Rolling from supine to prone** **[P]**
 - 1 ☐ no turning or rolling attempts
 - 2 ☐ makes 'wiggling' movements with the pelvis, but does not roll to side
 - 3 ☐ rolls to side, unilaterally ☐ R / ☐ L
 - 4 ☐ rolls to side, bilaterally
 - 5 ☐ turns unilaterally into prone ☐ R / ☐ L
 - 6 ☐ turns bilaterally into prone
- 14 **Reaching, grasping and manipulation of objects** **[P]**
 - 1 ☐ does not reach towards object
 - 2 ☐ does not reach, but shows pre-reaching movements
 - 3 ☐ reaches towards object but does not grasp it
 - 4 ☐ reaches towards, grasps and holds object, but does not manipulate object
 - 5 ☐ reaches towards, holds and manipulates 1 object
 - 6 ☐ reaches towards, holds and manipulates 2 objects
 - 7 ☐ reaches towards, holds and manipulates ≥ 3 objects

Supine continued

- 15** Reaching, grasping and manipulation of objects, presence of asymmetry **5**
- ☐ no reaching movements present or only pre-reaching movements present
- 1 ☐ strong asymmetry,
☐ R / ☐ L worst side
- 2 ☐ moderate asymmetry,
☐ R / ☐ L worst side
- 3 ☐ no or mild asymmetry
- 16** Variability of reaching or pre-reaching movements of the arms **VIA**
- ☐ the child does not show pre-reaching or reaching movements
- 1 ☐ insufficiently variable
- 2 ☐ sufficiently variable
- 17** Variability of pre-reaching or reaching movements of the arms: ability to make an adaptive selection **VIB**
- ☐ the child does not show pre-reaching or reaching movements
- 1 ☐ no selection
- 2 ☐ adaptive selection
- 18** Variability of hand motility during reaching, grasping and manipulation **VIA**
- ☐ no reaching movements present or only pre-reaching movements present
- 1 ☐ insufficiently variable
- 2 ☐ sufficiently variable
- 19** Variability of hand motility during reaching, grasping and manipulation: ability to make an adaptive selection **VIB**
- ☐ no reaching movements present or only pre-reaching movements present
- 1 ☐ no selection
- 2 ☐ adaptive selection
- 20** Tremor during reaching or pre-reaching **E**
- ☐ the child does not show pre-reaching or reaching movements
- 1 ☐ frequently present, describe type:
- 2 ☐ no or occasionally tremor present, describe type:
- 21** Fluency of motor behaviour in supine **E**
- 1 ☐ majority of movements non-fluent: stiff, jerky, floppy/sluggish, otherwise:
- 2 ☐ majority of movements fluent



Prone

- 1 **Head lift in prone** **P**
 - 1 ☐ does not lift or turn head
 - 2 ☐ does turn head to side position with a minimal lift of the head
 - 3 ☐ lifts head for a few seconds but no longer
 - 4 ☐ maintains head lifted for at least 10 seconds, but has some difficulty in looking around
 - 5 ☐ maintains head lifted and looks around
- 2 **Position of head, presence of prevailing head position to one side** **S**
 - ☐ does not rotate head into a side position
 - 1 ☐ strongly prevailing head position to the ☐ R / ☐ L
 - 2 ☐ moderately prevailing head position to the ☐ R / ☐ L
 - 3 ☐ no or mildly prevailing head position to one side
- 3 **Variability of head movements** **VIA**
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 4 **Variability of head movements: ability to make an adaptive selection** **VIB**
 - 1 ☐ no selection
 - 2 ☐ adaptive selection
- 5 **Functional ability of shoulder girdle in prone** **P**
 - 1 ☐ does not use arms and hands to move head and thorax up
 - 2 ☐ uses arms and hands to move head and thorax up, but does not succeed in active elbow and lower arm support
 - 3 ☐ is supported by elbows and lower arms
 - 4 ☐ lifts upper part of thorax by standing on hands and extended arms
- 6 **Functional ability of hands in prone** **P**
 - 1 ☐ has difficulties in using arms and hands for postural control and does not use hands for other activities
 - 2 ☐ uses both arms and hands for postural control, and does not use hands for other activities
 - 3 ☐ uses both arms for postural control while hands show some play activity
 - 4 ☐ uses one arm for postural support, while contralateral arm and hand are used for manipulation
- 7 **Arm posture and motility during activity in prone, presence of asymmetry** **S**
 - ☐ both arms remain in propped position provided by examiner
 - 1 ☐ strong asymmetry, ☐ R / ☐ L worst side
 - 2 ☐ moderate asymmetry, ☐ R / ☐ L worst side
 - 3 ☐ no or mild asymmetry
- 8 **Variability of pre-crawling movements of the legs** **VIA**
 - ☐ shows only crawling in prone or prefers to sit, stand or walk around
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 9 **Rolling from prone to supine** **P**
 - ☐ does not show rolling as the child prefers to change position with the help of sitting or crawling
 - 1 ☐ no turning or rolling attempts, while not able to change position with the help of sitting or crawling
 - 2 ☐ rolls to side, unilaterally ☐ R / ☐ L
 - 3 ☐ rolls to side, bilaterally
 - 4 ☐ turns unilaterally into supine ☐ R / ☐ L
 - 5 ☐ turns bilaterally into supine
- 10 **Progression in prone: development of crawling** **P**
 - 1 ☐ does not show wriggling, pivoting or crawling
 - 2 ☐ wriggling or pivoting
 - 3 ☐ abdominal crawling, uses only arms or legs
 - 4 ☐ abdominal crawling, uses arms and legs
 - 5 ☐ crawls on hands and knees, abdomen free from support surface
- 11 **Variability of wriggling, pivoting or crawling** **VIA**
 - ☐ does not or hardly show wriggling, pivoting or crawling
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 12 **Variability of wriggling, pivoting or crawling: ability to make an adaptive selection** **VIB**
 - ☐ does not or hardly show wriggling, pivoting or crawling
 - 1 ☐ no selection
 - 2 ☐ adaptive selection

Sitting

- 1 **Control of head movements** **[P]**
 - 1 ☐ cannot control head movements
 - 2 ☐ can control head movements to a limited extent
 - 3 ☐ can fully control head movements
- 2 **Position of head during sitting, presence of prevailing head position to one side** **[S]**
 - 1 ☐ strongly prevailing head position to the ☐ R / ☐ L
 - 2 ☐ moderately prevailing head position to the ☐ R / ☐ L
 - 3 ☐ no or mildly prevailing head position to one side
- 3 **Sitting ability** **[P]**
 - 1 ☐ can sit independently
 - 2 ☐ can sit with extreme pelvis anteversion (belly touching upper legs), with or without arms in propped position; cannot sit upright
 - 3 ☐ can sit more or less upright for a few seconds
 - 4 ☐ sits independently, but cannot shift weight or rotate trunk, or only sits between knees
 - 5 ☐ sits independently, is able to shift weight, but rotates trunk to a minimal extent only
 - 6 ☐ sits independently and is able to shift weight and rotate trunk
- 4 **Position of trunk during independent sitting, preference posture** **[P]**
 - 1 ☐ cannot sit independently (scored 1 or 2 at item 3)
 - 1 ☐ mostly round back
 - 2 ☐ mostly straight back, no lordosis, or sits often between knees
 - 3 ☐ straight back with some lordosis when sitting on buttocks
- 5 **Position of trunk during sitting or supported sitting** **[S]**
 - 1 ☐ strong asymmetry, collapses to ☐ R / ☐ L side
 - 2 ☐ moderate asymmetry, collapses to ☐ R / ☐ L side
 - 3 ☐ no or mild asymmetry
- 6 **Arm posture and motility during sitting or supported sitting, presence of asymmetry** **[S]**
 - 1 ☐ strong asymmetry,
 - ☐ R / ☐ L worst side
 - 2 ☐ moderate asymmetry,
 - ☐ R / ☐ L worst side
 - 3 ☐ no or mild asymmetry
- 7 **Need of arm support during sitting** **[P]**
 - 1 ☐ cannot sit independently (scored 1-3 at item 3)
 - 1 ☐ needs both arms for postural support
 - 2 ☐ needs one arm for postural support
 - 3 ☐ uses both arms for voluntary activity, does not use arms for postural support
- 8 **Variability in sitting motility** **[V/A]**
 - ☐ cannot sit independently (scored 1 or 2 at item 3)
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 9 **Variability sitting motility: ability to make an adaptive selection** **[V/B]**
 - ☐ cannot sit independently (scored 1 or 2 at item 3)
 - 1 ☐ no selection
 - 2 ☐ adaptive selection
- 10 **Sitting up** **[P]**
 - 1 ☐ cannot sit up independently
 - 2 ☐ can sit up independently
- 11 **Variability in sitting up behaviour** **[V/A]**
 - ☐ cannot sit up independently
 - ☐ did only sit up once during assessment
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 12 **Variability in sitting up behaviour: ability to make an adaptive selection** **[V/B]**
 - ☐ cannot sit up independently
 - ☐ did only sit up once during assessment
 - 1 ☐ no selection
 - 2 ☐ adaptive selection
- 13 **Bottom shuffling** **[V/A]**
 - ☐ cannot sit independently (scored 1-3 at item 3)
 - 1 ☐ bottom shuffling present as only strategy to move around
 - 2 ☐ no bottom shuffling present or bottom shuffling present as one of strategies to move around

Standing and walking

- 1 Standing ability** **V**
- ☐ cannot stand
 - ☐ stands with help
 - ☐ stands independently for a few seconds
 - ☐ stands independently for more than 10 seconds, but does not shift weight or rotate trunk
 - ☐ stands independently, can shift weight in forward and sideward direction, but has difficulties in rotating trunk
 - ☐ stands independently and is able to rotate trunk
- 2 Standing up** **V**
- ☐ cannot not stand up
 - ☐ gets on knees
 - ☐ stands up independently with the use of e.g. furniture
 - ☐ stands up independently, without using furniture
- 3 Variability in standing up behaviour** **VIA**
- ☐ cannot stand up
 - ☐ did only stand up once during assessment
 - ☐ insufficiently variable
 - ☐ sufficiently variable
- 4 Variability in standing up behaviour: ability to make an adaptive selection** **VIB**
- ☐ cannot stand up
 - ☐ did only stand up once during assessment
 - ☐ no selection
 - ☐ adaptive selection
- 5 Walking** **V**
- ☐ cannot walk
 - ☐ walks when receiving support by two hands
 - ☐ walks when receiving support by one hand
 - ☐ walks independently
- 6 Balance during independent walking** **V**
- ☐ cannot walk independently
 - ☐ poor balancing capacities
 - ☐ moderate balancing capacities
 - ☐ good balancing capacities
- 7 Arm posture and motility during independent walking** **V**
- ☐ cannot walk independently
 - ☐ predominantly high or semi-half guard
 - ☐ arbitrary arm posture
- 8 Arm posture and motility during independent walking, presence of asymmetry** **V**
- ☐ cannot walk independently
 - ☐ strong asymmetry,
 - ☐ R / ☐ L worst side
 - ☐ moderate asymmetry,
 - ☐ R / ☐ L worst side
 - ☐ no or mild asymmetry
- 9 Variability of arm movements during independent walking** **VIA**
- ☐ cannot walk independently
 - ☐ predominantly semi-half or high guard
 - ☐ insufficiently variable
 - ☐ sufficiently variable
- 10 Variability of arm movements during independent walking: ability to make an adaptive selection** **VIB**
- ☐ cannot walk independently
 - ☐ predominantly semi-half or high guard
 - ☐ no selection
 - ☐ adaptive selection
- 11 Variability of trunk movements during standing and independent walking** **VIA**
- ☐ cannot walk independently
 - ☐ insufficiently variable
 - ☐ sufficiently variable
- 12 Variability of trunk movements during independent walking** **VIB**
- ☐ cannot walk independently
 - ☐ no selection
 - ☐ adaptive selection
- 13 Heel-toe gait during independent walking** **V**
- ☐ cannot walk independently
 - ☐ no or only occasionally heel-toe gait
 - ☐ predominantly heel-toe gait
- 14 Variability of placing of feet during independent walking** **VIA**
- ☐ cannot walk independently
 - ☐ insufficiently variable
 - ☐ sufficiently variable
- 15 Variability of placing of feet during independent walking: ability to make an adaptive selection** **VIB**
- ☐ cannot walk independently
 - ☐ no selection
 - ☐ adaptive selection
- 16 Variability of placing of feet during independent walking** **V**
- ☐ cannot walk independently
 - ☐ majority of walking movements non-fluent: stiff, jerky, floppy/sluggish, other:
 - ☐ large majority of walking movements fluent
- 17 Fluency of motility during independent walking** **V**
- ☐ cannot walk independently
 - ☐ majority of walking movements non-fluent: stiff, jerky, floppy/sluggish, other:
 - ☐ large majority of walking movements fluent

Reaching, grasping and manipulation of objects while sitting on parents lap

- 1 Reaching, grasping and manipulation of objects** **P**
- 1 ☐ does not reach towards object
 - 2 ☐ does not reach, but shows pre-reaching movements
 - 3 ☐ reaches towards object but does not grasp it
 - 4 ☐ reaches towards, grasps and holds object, but does not manipulate object
 - 5 ☐ reaches towards, holds and manipulates 1 object
 - 6 ☐ reaches towards, holds and manipulates 2 objects
 - 7 ☐ reaches towards, holds and manipulates ≥ 3 objects
- 2 Reaching, grasping and manipulation of objects, presence of asymmetry** **S**
- 1 ☐ does not reach towards object
 - 1 ☐ strong asymmetry, ☐ R / ☐ L worst side
 - 2 ☐ moderate asymmetry, ☐ R / ☐ L worst side
 - 3 ☐ no or mild asymmetry
- 3 Variability of pre-reaching or reaching movements of the arms** **VIA**
- 1 ☐ the child does not show pre-reaching or reaching movements
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 4 Variability of pre-reaching or reaching movements: ability to make an adaptive selection** **VIB**
- 1 ☐ the child does not show pre-reaching or reaching movements
 - 1 ☐ no selection
 - 2 ☐ adaptive selection
- 5 Type of grasping (score best performance when dealing with a small object), sitting or supine** **P**
- 1 ☐ does not grasp object
 - 1 ☐ palmar grasp
 - 2 ☐ radial-palmar grasp
 - 3 ☐ scissor grasp
 - 4 ☐ inferior pincer grasp
 - 5 ☐ pincer grasp
- 6 Variability of hand motility during reaching and grasping** **VIA**
- 1 ☐ no reaching movements present or only pre-reaching movements present
 - 1 ☐ insufficiently variable
 - 2 ☐ sufficiently variable
- 7 Variability of hand motility during reaching and grasping: ability to make an adaptive selection** **VIB**
- 1 ☐ no reaching movements present or only pre-reaching movements present
 - 1 ☐ no selection
 - 2 ☐ adaptive selection
- 8 Tremor during reaching or pre-reaching** **P**
- 1 ☐ the child does not show pre-reaching or reaching movements
 - 1 ☐ frequently present, describe type:
 - 2 ☐ no or occasionally tremor present, describe type:
- 9 Fluency of motility during reaching or pre-reaching** **P**
- 1 ☐ the child does not show pre-reaching or reaching movements
 - 1 ☐ majority of movements non-fluent: stiff, jerky, floppy/sluggish, otherwise:
 - 2 ☐ large majority of movements fluent

General					
1 Facial expression V/A	3 Drooling V/A	5 Tremor F	6 Fluency of motor behaviour F		
1 <input type="checkbox"/> insufficiently variable 2 <input type="checkbox"/> sufficiently variable	1 <input type="checkbox"/> marked drooling 2 <input type="checkbox"/> no or little drooling	1 <input type="checkbox"/> frequently present, describe type: 2 <input type="checkbox"/> no or occasionally tremor present, describe type:	1 <input type="checkbox"/> majority of movements non-fluent: stiff, jerky, floppy/sluggish, otherwise: 2 <input type="checkbox"/> majority of movements fluent		
2 Facial expression: ability to make an adaptive selection V/B	4 Presence of stereotyped tongue protrusion V/A				
1 <input type="checkbox"/> no selection 2 <input type="checkbox"/> adaptive selection	1 <input type="checkbox"/> yes 2 <input type="checkbox"/> no				
Remarks on					
1 Quantity of motility	2 Behavioural state	3 Health condition	4 Other		
<input type="checkbox"/> - <input type="checkbox"/> + <input type="checkbox"/> ++ <input type="checkbox"/> +++		